NATIONAL HURRICANE CENTER TROPICAL CYCLONE REPORT[1]

HURRICANE DOUGLAS

(EP082020)

20–28 July 2020

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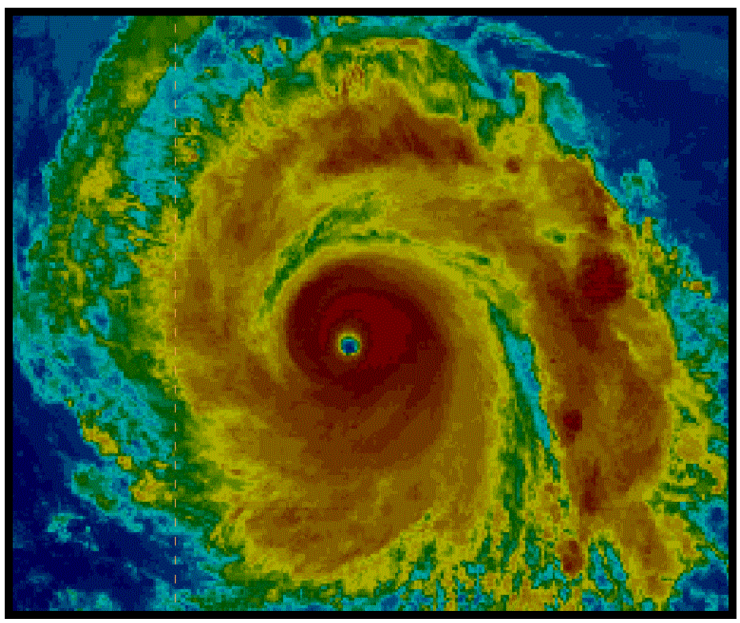
21 November 2020



GOES-17 10.3-μM INFRARED SATELLITE IMAGE OF HURRICANE DOUGLAS NEAR ITS PEAK INTENSITY AT 0000 UTC 24 JULY 2020.

Douglas formed in the central portion of the eastern Pacific basin and become a category four hurricane (on the Saffir-Simpson Hurricane Wind Scale) before it crossed into the central Pacific. The hurricane eventually passed just north of the main Hawaiian Islands before crossing over a portion of the Northwestern Hawaiian Islands.

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[1] This report is based on Douglas' history in the National Hurricane Center's area of responsibility in the eastern Pacific basin (east of 140°W longitude). The report will be updated once the Central Pacific Hurricane Center completes its analysis of Douglas in the central North Pacific basin (west of 140°W longitude).

Hurricane Douglas

20–28 JULY 2020

SYNOPTIC HISTORY

Douglas' origins can be traced to a tropical wave that emerged off the coast of Africa on 8 July. The deep convection quickly dissipated as the wave began to traverse the tropical Atlantic. The wave crossed northern South America from 12–14 July and then central America on 15 July before entering the eastern Pacific basin. There were intermittent bursts of deep convection associated with the wave as it passed south and southwest of the southern coast of Mexico from 16–18 July, but there were no signs of organization during that time. Early on 19 July, the shower and thunderstorm activity became more concentrated over the northern portion of the wave, and a little later that day it became apparent in satellite images and scatterometer wind data (not shown) that an area of low pressure was developing. By 0000 UTC 20 July, the satellite presentation continued to improve, and the system had developed sufficient organization to be considered a tropical depression while located about 700 n mi southwest of the southern tip of the Baja California peninsula. The "best track" chart of the tropical cyclone's path is given in Fig. 1, with the wind and pressure histories shown in Figs. 2 and 3, respectively. The best track positions and intensities are listed in Table 1[2].

The depression continued to become better organized on 20 July, and it is estimated that it strengthened into a tropical storm by 1800 UTC that day, while located about 800 n mi south of the southern tip of the Baja California peninsula. The cyclone initially moved southwestward on 20 July, then west-southwestward through early 22 July as it was steered by a mid-level ridge located to its northwest. The environment during that time was generally conducive for strengthening, with low vertical wind shear and warm waters. Although Douglas battled some dry air intrusions on 21 July, the cyclone strengthened to a hurricane by 1800 UTC 22 July while located about midway between the coast of southwestern Mexico and the Island of Hawai'i. Around this same time the hurricane turned westward and then west-northwestward as Douglas began to move around the southern and southwestern portion of the mid-level ridge. This ridge would build westward with time and steer the hurricane in a generally west-northwestward direction until the cyclone dissipated, which would be several days after it passed into the central Pacific basin. When Douglas became a hurricane, a period of rapid intensification was already underway and the cyclone became a 100-kt category three hurricane on the Saffir-Simpson Hurricane Wind Scale by 0600 UTC 23 July, just 12 h after reaching hurricane strength. Douglas continued to intensify, and it became a 115-kt category four hurricane by 0000 UTC July 24 (cover photo). Douglas maintained this intensity when it crossed into the central Pacific basin just after

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[2] A digital record of the complete best track, including wind radii, can be found on line at ftp://ftp.nhc.noaa.gov/atcf. Data for the current year's storms are located in the *btk* directory, while previous years' data are located in the *archive* directory.

0600 UTC that day. Douglas was the strongest hurricane to cross from the eastern Pacific to central Pacific basin since Lane in 2018.

The hurricane began to weaken just after it moved into the central Pacific basin as it encountered cooler waters. By the time the hurricane started to pass north of the island of Hawai'i at around 1800 UTC 26 July, the maximum winds had decreased to 75 kt. Some fluctuations in intensity occurred as the center of Douglas passed within 50 n mi north of several of the main Hawaiian Islands. The cyclone then encountered increasing vertical wind shear by late 27 July which exposed the low-level center, and the cyclone weakened to a tropical storm by 0000 UTC 28 July while located about 220 n mi west-northwest of Lihue, Hawaii. It was about this same time that the system began to pass over a portion of the Northwestern Hawaiian Islands. Douglas weakened quickly as it moved west-northwest over the island chain, while the shear stripped any remaining convection from near the center of the cyclone. The circulation center became increasingly elongated and it is estimated that the cyclone dissipated by 0000 UTC 29 July while located about 230 n mi south-southeast of Midway Island.

METEOROLOGICAL STATISTICS

Observations in Douglas (Figs. 2 and 3) include subjective satellite-based Dvorak and intensity estimates from the Tropical Analysis and Forecast Branch (TAFB), the Satellite Analysis Branch (SAB), the Central Pacific Hurricane Center (PHFO), and the Joint Typhoon Warning Center (JTWC), and objective Advanced Dvorak Technique (ADT) estimates and Satellite Consensus (SATCON) estimates from the Cooperative Institute for Meteorological Satellite Studies/University of Wisconsin-Madison. Observations also include flight-level, stepped frequency microwave radiometer (SFMR), and dropwindsonde observations from 5 flights (25 center fixes) by the 53rd Weather Reconnaissance Squadron of the U.S. Air Force Reserve during the period 25–27 July. Data and imagery from NOAA polar-orbiting satellites including the Advanced Microwave Sounding Unit (AMSU), the NASA Global Precipitation Mission (GPM), the European Space Agency's Advanced Scatterometer (ASCAT), and Defense Meteorological Satellite Program (DMSP) satellites, among others, were also useful in constructing the best track of Douglas.

The peak intensity of Douglas at 0000 UTC 24 July was based on the Dvorak intensity estimates from TAFB and SAB of T6.0, which corresponds to a 115-kt intensity. The University of Wisconsin CIMSS ADT also provided a similar intensity estimate that that time. The estimated minimum central pressure of 954 mb was derived using the Knaff-Zehr-Courtney pressure-wind relationship.

There were no ship reports of winds of tropical storm force associated with Douglas in the eastern Pacific basin.

CASUALTY AND DAMAGE STATISTICS

There were no reports of damage or casualties associated with Hurricane Douglas in the eastern Pacific basin.

FORECAST AND WARNING CRITIQUE

The genesis of Douglas was not well anticipated. The system that became Douglas was initially mentioned in the tropical weather outlook (TWO) only 18 h prior to genesis, introducing a low (<40%) chance of formation within both the 2-day and 5-day time periods (Table 2). The probabilities were raised to a medium (40–60%) chance for development within the next 5 days 12 h prior to formation. The 2-day and 5-day probabilities were then raised to the medium and high categories (>60%), respectively, 6 h before genesis occurred. The 2-day probabilities for formation never reached the high category prior to the system developing into a tropical cyclone. One reason that the genesis forecasts fell behind on this system was the lack of model support. Only two days prior to formation, the global models that did indicate that genesis would occur did not show it occurring until days 5–7. Only two global models indicated genesis within 5 days from the 0000 UTC run cycle 24 h prior to formation. One possible explanation for the models not recognizing genesis for Douglas was that they were resolving a larger scale gyre that also spawned Tropical Depression Seven-E. So, while the specific disturbance that resulted in the genesis of Douglas was not well forecast, the large-scale feature was accurately depicted by the models as a region of enhanced probability of tropical cyclone development.

A preliminary verification of NHC official track forecasts for Douglas is given in Table 3a. Official track forecast errors were lower than the mean official errors for the previous 5-yr period for the 12 h forecast time, near the mean official errors for the 24, 36, and 48 h forecast times, and above the long-term mean official errors for 60–120 h. The climatology and persistence errors (OCD5) were much higher than their 5-yr means at 24–120 h, indicating that Douglas' track was likely more difficult to predict than average at those time frames, despite the relatively straight track. A homogeneous comparison of the official track errors with selected guidance models is given in Table 3b. Overall, the consensus track guidance performed slightly better than the official NHC forecasts. However, the NHC forecast performed better than the HWFI, GFSI, and CMCI at all time periods. The best-performing global model was the UKMET (EGRI), which beat the official NHC forecasts at all verifying times.

A preliminary verification of NHC official intensity forecasts for Douglas is given in Table 4a. Official intensity forecast errors were below the mean official errors for the previous 5-yr period for the verifying 24, 36, and 48 h forecast times and above the long-term mean official errors for 60–120 h. The OCD5 errors were well above their 5-yr means through 72 h, indicating that Douglas' intensity was difficult to predict for those forecast times. A homogeneous comparison of the official intensity errors with selected guidance models is given in Table 4b. The NHC forecast performed better than the majority of the models at all forecast times. The only model that performed better than the NHC forecast for intensity at most forecast times was the FSU Superensemble (FSSE).

No coastal watches or warnings were issued in association with Douglas in the eastern Pacific basin.

Table 1. Best track for Hurricane Douglas, 20–28 July 2020. The portion of the best track west of 140°W in the central Pacific basin is preliminary.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
20 / 0000	14.7	118.8	1008	30	tropical depression
20 / 0600	14.3	119.1	1008	30	"
20 / 1200	13.9	119.4	1008	30	"
20 / 1800	13.5	120.0	1006	35	tropical storm
21 / 0000	13.3	121.0	1004	40	"
21 / 0600	13.0	122.3	1001	50	"
21 / 1200	12.6	123.6	998	55	"
21 / 1800	12.2	124.8	998	55	"
22 / 0000	12.1	126.1	998	55	"
22 / 0600	11.8	127.5	998	55	"
22 / 1200	11.6	128.9	996	60	"
22 / 1800	11.9	130.3	989	70	hurricane
23 / 0000	12.3	131.8	981	80	"
23 / 0600	12.8	133.3	967	100	"
23 / 1200	13.3	134.9	964	105	"
23 / 1800	13.8	136.5	959	110	"
24 / 0000	14.6	138.0	954	115	"
24 / 0600	15.3	139.5	954	115	"
24 / 1200	16.1	141.1	962	105	"
24 / 1800	16.7	142.7	967	100	"
25 / 0000	17.5	144.3	967	100	"
25 / 0600	18.2	145.9	972	95	"
25 / 1200	18.7	147.6	975	90	"
25 / 1800	19.1	149.2	982	85	"
26 / 0000	19.7	150.7	982	80	"
26 / 0600	20.1	152.1	983	80	"
26 / 1200	20.5	153.6	983	80	"
26 / 1800	21.0	155.1	987	75	"
27 / 0000	21.7	156.6	989	75	"

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
27 / 0600	22.3	158.1	987	80	"
27 / 1200	22.7	159.6	987	80	"
27 / 1800	22.8	161.4	992	70	"
28 / 0000	22.9	162.8	996	60	tropical storm
28 / 0600	23.2	164.2	999	50	"
28 / 1200	23.8	165.7	1002	45	"
28 / 1800	24.3	167.7	1004	40	"
29 / 0000					dissipated
24 / 0000	14.6	138.0	954	115	maximum wind and minimum pressure

Table 2. Number of hours in advance of formation associated with the first NHC Tropical Weather Outlook forecast in the indicated likelihood category. Note that the timings for the “Low” category do not include forecasts of a 0% chance of genesis.

	Hours Before Genesis	
	48-Hour Outlook	**120-Hour Outlook**
Low (<40%)	18	18
Medium (40%-60%)	6	12
High (>60%)	-	6

Table 3a. Preliminary NHC official (OFCL) and climatology-persistence skill baseline (OCD5) track forecast errors (n mi) for Hurricane Douglas, 20–28 July 2020. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	**20.8**	35.3	47.8	58.8	73.2	90.2	138.8	192.8
OCD5	34.4	84.3	142.9	200.4	260.9	320.3	433.4	565.8
Forecasts	16	16	16	16	16	16	16	14
OFCL (2015-19)	21.8	34.0	44.9	55.3	66.2	77.1	99.1	123.2
OCD5 (2015-19)	34.3	69.9	108.7	146.8	181.4	216.0	268.7	328.0

Table 3b. Homogeneous comparison of selected track forecast guidance models (in n mi) for Hurricane Douglas, 20–28 July 2020. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 4a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	20.9	35.3	52.0	65.9	77.1	91.1	139.8	184.3
OCD5	25.7	68.3	119.7	172.8	228.4	282.0	385.6	483.1
TABS	21.5	45.7	70.6	86.6	95.4	101.0	158.0	221.9
TABM	**17.0**	**32.5**	**51.3**	68.8	85.3	100.3	153.2	196.1
TABD	**19.1**	44.6	74.1	106.3	143.2	181.5	281.3	361.0
TVDG	**18.7**	**33.1**	**47.8**	**59.2**	**67.5**	**79.4**	**124.7**	**171.0**
TVCE	**18.4**	**33.4**	**50.0**	**64.8**	**74.4**	**87.5**	**137.5**	187.4
GFEX	20.9	37.2	53.4	**64.8**	**74.7**	**86.1**	**128.6**	**165.4**
TVCX	**19.6**	**34.3**	**48.6**	**61.8**	**71.0**	**83.2**	**128.4**	**174.3**
FSSE	**19.2**	36.3	**50.9**	**61.3**	**71.9**	**83.2**	**129.7**	**176.4**
HCCA	**19.8**	**33.4**	**48.0**	**58.9**	**68.5**	**83.4**	140.0	195.9
AEMI	**20.7**	40.4	60.9	80.8	99.5	121.0	175.8	217.5
NVGI	24.7	43.4	52.7	**47.6**	**42.4**	**53.6**	**116.9**	220.8
CMCI	30.0	53.5	74.8	91.8	109.1	125.6	177.9	249.9
EMXI	23.4	43.7	60.1	72.1	79.6	**85.9**	**107.3**	**122.2**
EGRI	**17.5**	**28.1**	**39.6**	**46.3**	**50.3**	**56.3**	**87.7**	**149.8**
HWFI	23.0	48.6	79.3	106.4	128.6	154.7	245.1	333.7
HMNI	**13.7**	**32.4**	56.7	76.1	88.6	103.7	165.8	226.0
GFSI	23.1	40.0	57.3	78.8	94.9	113.6	175.2	232.7
Forecasts	11	11	11	11	11	11	11	10

Table 4a. Preliminary NHC official (OFCL) and climatology-persistence skill baseline (OCD5) intensity forecast errors (kt) for Hurricane Douglas, 20–28 July 2020. Mean errors for the previous 5-yr period are shown for comparison. Official errors that are smaller than the 5-yr means are shown in boldface type.

	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	7.5	**8.4**	**8.1**	**12.2**	18.8	23.1	21.2	20.4
OCD5	9.8	15.9	19.0	24.3	27.5	28.2	22.4	14.5
Forecasts	16	16	16	16	16	16	16	14
OFCL (2015-19)	6.0	9.9	12.1	13.5	14.5	15.4	15.6	16.4
OCD5 (2015-19)	7.8	13.0	16.6	18.9	20.2	21.4	22.6	22.4

Table 4b. Homogeneous comparison of selected intensity forecast guidance models (in kt) for Hurricane Douglas, 20–28 July 2020. Errors smaller than the NHC official forecast are shown in boldface type. The number of official forecasts shown here will generally be smaller than that shown in Table 5a due to the homogeneity requirement.

Model ID	Forecast Period (h)							
	12	24	36	48	60	72	96	120
OFCL	6.4	8.2	9.1	14.1	18.2	20.9	20.5	18.0
OCD5	8.5	16.5	21.3	26.5	25.6	22.0	**18.8**	**11.8**
IVDR	8.0	12.7	14.2	18.9	21.1	21.7	23.2	19.8
IVCN	8.0	12.8	14.3	18.5	20.7	22.3	23.9	20.3
ICON	8.2	13.3	14.5	18.8	20.9	22.3	22.7	20.2
LGEM	8.0	16.2	20.3	24.9	26.7	27.7	29.0	24.6
DSHP	6.8	10.3	10.2	15.3	**17.6**	20.9	24.9	21.8
FSSE	8.1	11.4	10.2	**12.5**	**14.5**	**14.1**	**13.5**	**12.9**
HCCA	7.9	11.5	12.3	14.9	18.4	**20.4**	21.4	19.6
CMCI	9.5	15.5	19.9	27.5	28.6	26.9	23.0	26.6
EMXI	7.2	11.8	17.5	23.9	23.5	**20.8**	22.5	**17.7**
EGRI	9.3	14.5	19.6	25.5	24.5	21.2	**15.0**	21.7
HWFI	9.5	14.7	15.5	20.0	22.4	21.6	**16.8**	21.1
HMNI	9.5	14.7	14.7	16.5	18.6	**19.8**	22.0	**14.1**
GFSI	8.2	14.1	20.2	24.9	25.0	23.6	23.5	24.2
Forecasts	11	11	11	11	11	11	11	10

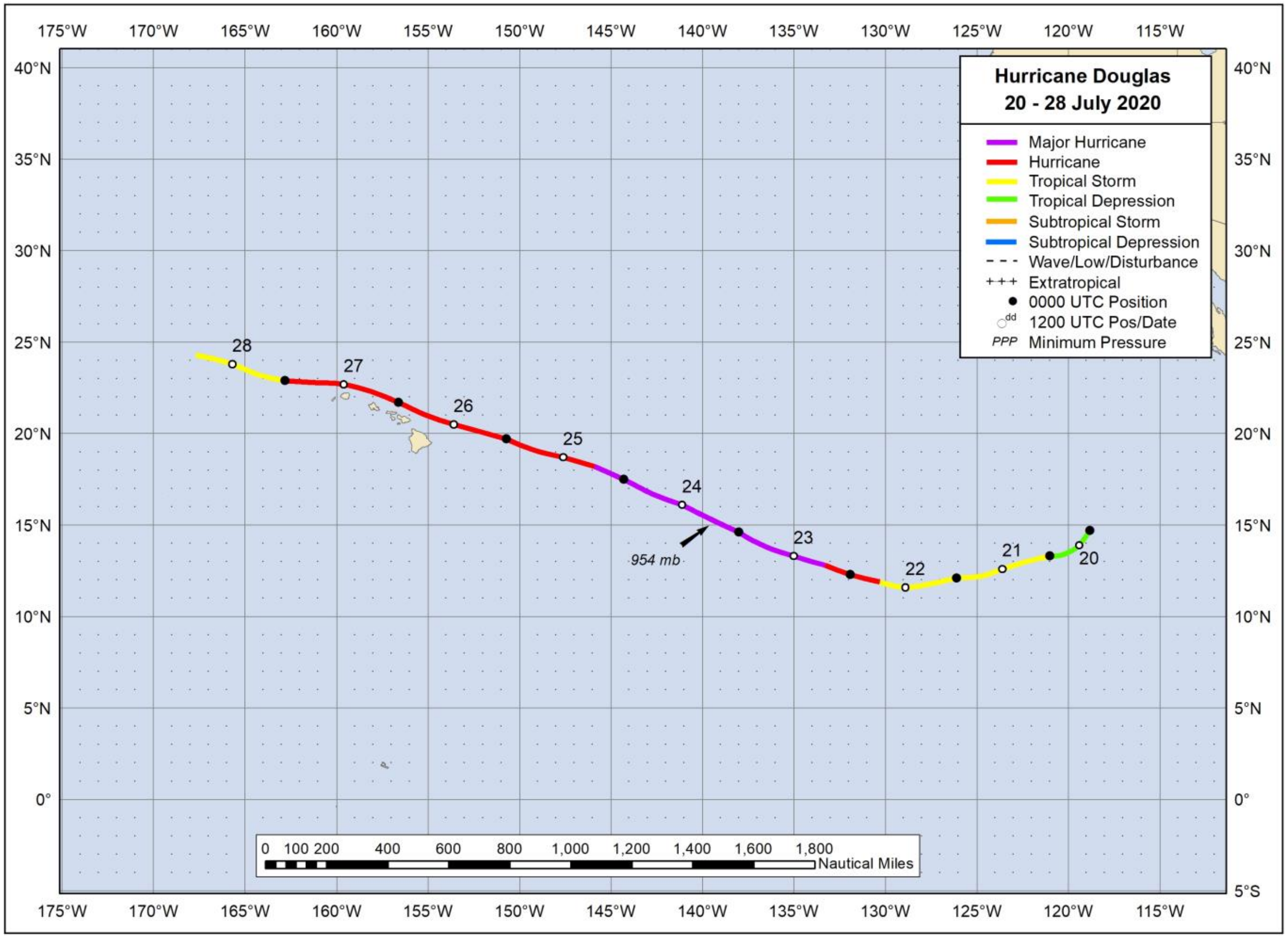

Figure 1. Best track positions for Hurricane Douglas, 20–28 July 2020. The portion of the track west of 140°W in the central Pacific basin is preliminary and reflects near real-time estimates from the Central Pacific Hurricane Center.

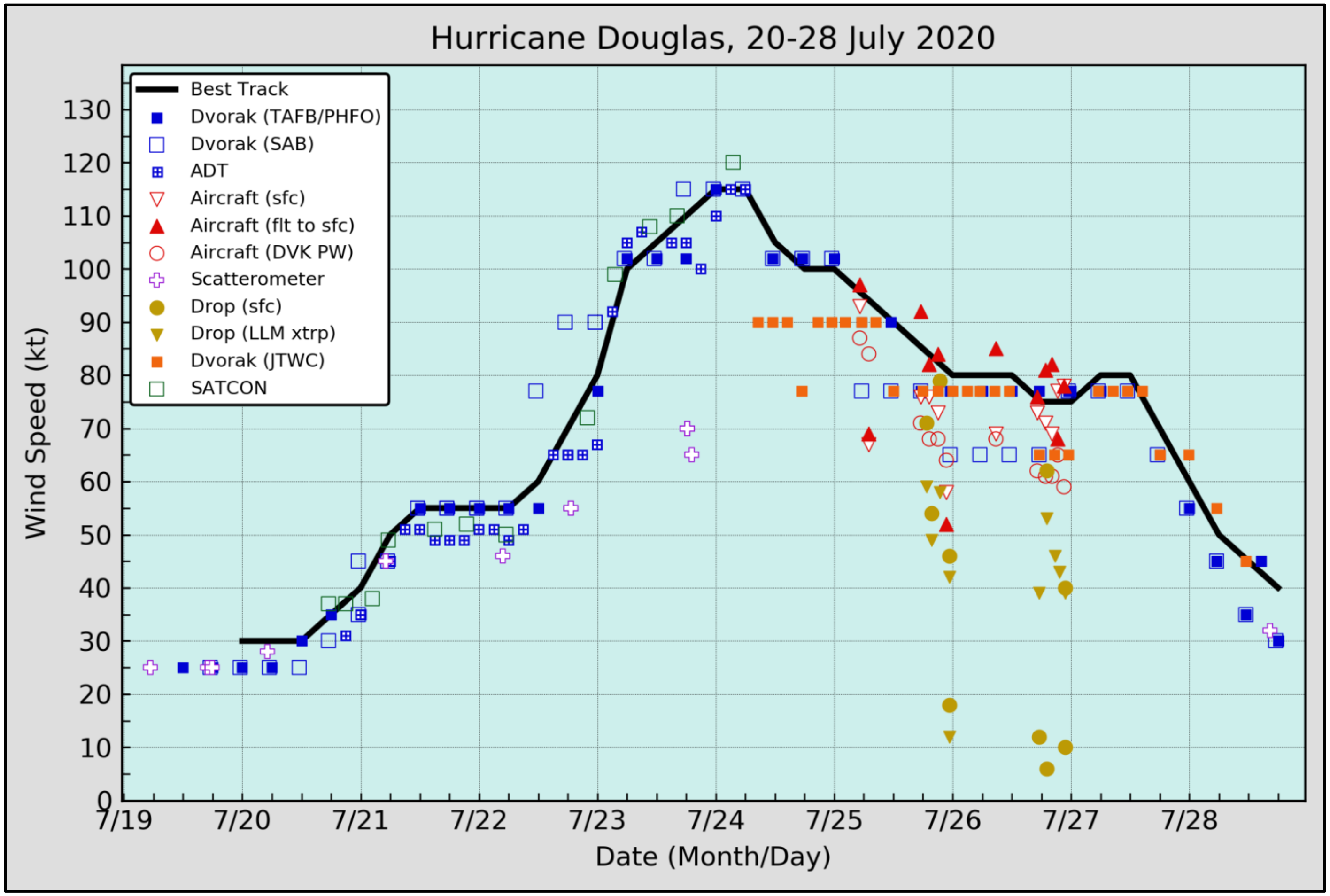

Figure 2. Selected wind observations and best track maximum sustained surface wind speed curve for Hurricane Douglas, 20–28 July 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% adjustment factors for observations from 700 mb, 850 mb, and 1500 ft., respectively. Dashed vertical lines correspond to 0000 UTC. The best track after 0600 UTC 24 July in the central Pacific basin is preliminary and reflects near real-time estimates from the Central Pacific Hurricane Center.

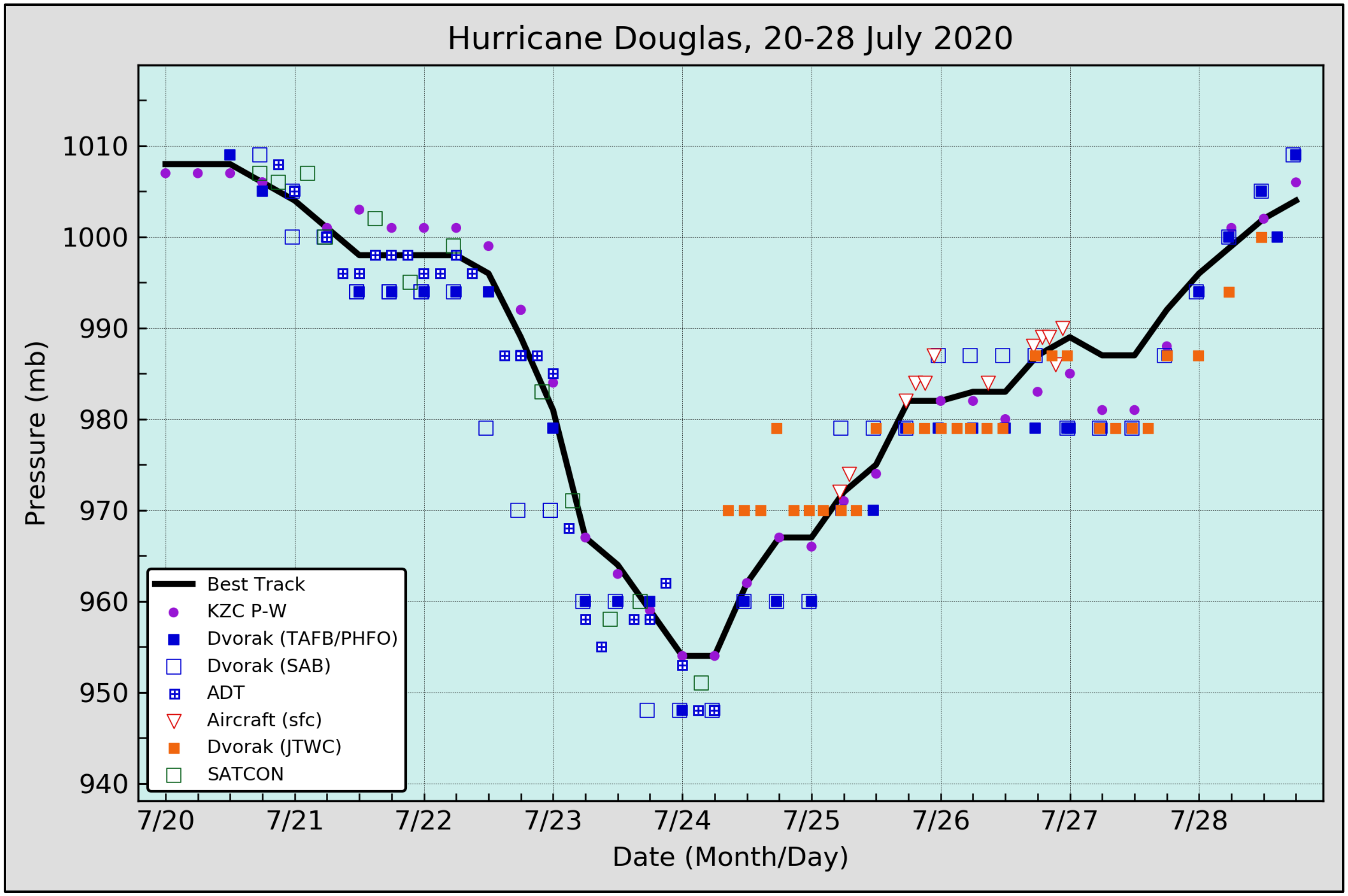

Figure 3. Selected pressure observations and best track minimum central pressure curve for Hurricane Douglas, 20–28 July 2020. Advanced Dvorak Technique estimates represent the Current Intensity at the nominal observation time. SATCON intensity estimates are from the Cooperative Institute for Meteorological Satellite Studies. KZC P-W refers to pressure estimates derived using the Knaff-Zehr-Courtney pressure-wind relationship. Dashed vertical lines correspond to 0000 UTC. The best track after 0600 UTC 24 July in the central Pacific basin is preliminary and reflects near real-time estimates from the Central Pacific Hurricane Center.